W. VON BOLTON.

SPRING FOR TIMEPIECES.

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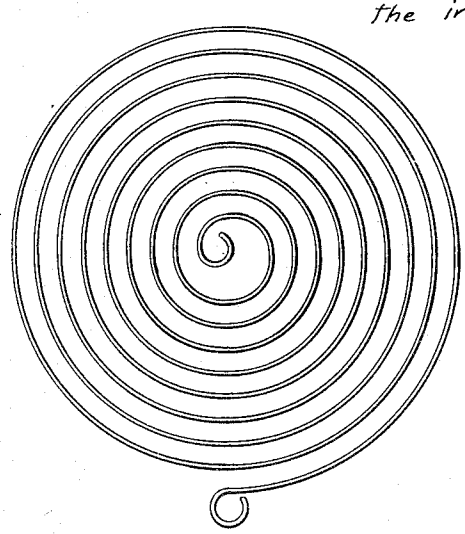
947,147. Patented Jan. 18, 1910.

Containing or composed of tantalum and element of the iron group



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UNITED STATES PATENT OFFICE.

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SPRING FOR TIMEPIECES.

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To all whom it may concern:

Be it known that I, WERNER VON BOLTON, a subject of the Czar of Russia, and resident of Charlottenburg, near Berlin, Germany, have invented certain new and useful Improvements in Springs for Timepieces, of which the following is a specification.

The present invention relates to an improved construction of springs and more particularly to springs which are employed in time pieces. Heretofore springs of this character have generally been made of steel, due to the fact that that material combines a great many advantageous properties, such as being capable of easy manufacture, considerable strength, resistance to wear and the like. There are, however, certain inherent objections to the use of steel in springs for time pieces. This material is not permanent under all conditions and being susceptible to magnetism, rust and wear, it often proves unsatisfactory. Prior to my invention, however, so far as I am aware, no efficient substitute for steel was suggested, and I therefore believe that I am the first to overcome these difficulties and to provide a spring for time pieces which is capable of answering the severe requirements which are demanded. In accordance with my invention the spring contains tantalum combined with an element of the iron group.

Tantalum has been proposed for use in filaments for electric lighting in which its high melting point is the chief property utilized. I have found, however, that tantalum possesses a great many properties which were not heretofore utilized, and which are of special advantage in the springs of time pieces. It possesses, like steel, the property of being easily worked and hardened. It offers greater resistance to fracture than steel and it has great resiliency and elasticity. Its hardness can be increased to such a degree as to greatly exceed that of the best steel, and it almost equals the diamond in its hardness. It has the further advantage over steel in being one of the precious metals which is not affected by the atmosphere and which at ordinary temperatures completely resists the action of most acids. A further important advantage which it possesses is that it is non-magnetic or substantially so. Being extremely hard, it has very great resistance to wear, and being resilient and elastic, while at the same time possessing great strength, it has the yielding property of steel with less liability to fracture, being non-magnetic and resistant to acids and to the atmosphere, it has a permanence which steel entirely lacks. Having a very high melting point, it is capable of use at temperatures beyond those at which steel would be of service.

In the accompanying drawing I have shown an example of my invention.

Said drawing illustrates conventionally a clock spring containing or composed of tantalum and an element of the iron group.

In order to work the metal satisfactorily, it must be previously well fused. This is preferably done by heating the metal in a vacuum by electrical means, such as electrical resistance or directly by passing an electric current through it. By the fusing process, the metal is freed from impurities, while at the same time it is rendered homogeneous. The metal which has been fused and thus rendered homogeneous can be readily worked mechanically in known manner. It can be hammered, rolled, drawn, filed and the like and thus brought into the desired form. When being mechanically worked, particularly if it contains a small quantity of iron or other hardening medium, the metal readily assumes so great a degree of hardness that further working is rendered impossible, and it must then be carefully reheated or annealed in order to be rendered soft again. In this annealing process, care must be taken that the temperature does not rise too high as otherwise the metal is more easily attacked by the oxygen of the atmosphere. Even in the form of the finest drawn wire or the thinnest rolled bands, however, the metal will stand a heating in the open air up to a dark red heat without being appreciably affected. When so heated, the metal shows a coloring similar to tempered steel. In order to prevent too great a heating, especially when working with fine parts of pure tantalum, it is preferable to effect the heating indirectly by bringing large plates or drums to the temperature to which the parts to be heated are required to be brought, and then to bring the objects of tantalum to be heated in contact with these plates or drums. If on the other hand, it is desired to raise the objects of tantalum

to higher temperatures without their being materially affected on their surfaces, it is advantageous to effect the heating in a vacuum as at very high temperatures pure tantalum combines with almost all known substances.

The properties of tantalum above referred to are generally not destroyed by the addition of an element of the iron group, but in many instances are even accentuated. By an addition of the metal of the iron group the metal becomes harder, while at the same time retaining its elasticity and other properties. Small quantities of the hardening agent are sufficient to produce great hardness. If the admixture of such substances is increased materially beyond a small percentage, the metal generally becomes so brittle that no further working of it is possible. With the proper proportion of hardening agent, however, the metal in spite of its increased hardness, is still more elastic and resilient than steel. A subsequent hardening of the already worked article of pure tantalum can be effected by heating the metal to redness in the presence of the hardening medium, in a manner similar to the treatment of steel. The most serviceable alloys of iron and tantalum are on the one hand those which consist of iron containing only small quantities of tantalum, or on the other hand those which consist of tantalum having only a small percentage of iron. The properties of these alloys can be varied to a great extent by changing the proportions of the constituents.

Claims.

1. A spring for time pieces containing tantalum and an element of the iron group.

2. A spring for time pieces composed of tantalum and an element of the iron group.

3. A spring for time pieces, containing tantalum and iron.

4. A spring for time pieces, composed of tantalum and iron.

WERNER VON BOLTON.

Witnesses:
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